INDOOR AIR QUALITY ASSESSMENT

Department of Developmental Services &
Department of Mental Health Service Center
35 Nagog Park
Acton, Massachusetts

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
October 2016

Background

Building:	Department of Developmental Services (DDS) & Department of Mental Health (DMH) Service Center
Address:	35 Nagog Park Acton, MA
Assessment Requested by:	Jamie Merrill Blood, Project Manger, Division of Capital Assets & Maintenance (DCAMM)
Reason for Request:	General indoor air quality (IAQ) for proactive post-occupancy testing
Date of Assessment:	August 1, 2016
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Jason Dustin, Environmental Analyst/Inspector, IAQ Program
Building Description:	Brick-faced building with a flat roof. DDS & DMH occupy half of the 2nd floor totaling 12,500 square feet
Building Population:	Approximately 48 employees
Year of Construction:	1988, complete renovation of space in 2016
Windows:	Not openable

Methods

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

IAQ Testing Results

The following is a summary of indoor air testing results (Table 1).

- ***Carbon dioxide levels*** were below 800 parts per million (ppm) in all areas assessed, indicating adequate fresh air in the space.
- ***Temperature*** was within the recommended range of 70°F to 78°F in all areas assessed.
- ***Relative humidity*** was within the recommended range of 40% to 60% in all areas assessed.

- ***Carbon monoxide*** levels were non-detectable in all indoor areas assessed.
- ***Fine particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 $\mu g/m^3$ in all areas assessed.

The assessment results indicate that the ventilation system is providing adequate fresh air for the occupancy in the building. Note that many areas had low occupancy which can reduce the creation of carbon dioxide. To maximize air exchange, the BEH recommends that mechanical ventilation systems operate continuously during periods of occupancy. Without the system operating as designed, normally occurring pollutants cannot be diluted or removed, allowing them to build up and lead to IAQ/comfort complaints.

Ventilation

A heating, ventilating, and air conditioning (HVAC) system has several functions. First it provides heating and, if equipped, cooling. Second, it is a source of fresh air. Finally, an HVAC system will dilute and remove normally occurring indoor environmental pollutants by not only introducing fresh air, but by filtering the airstream and ejecting stale air to the outdoors via exhaust ventilation. Even if an HVAC system is operating as designed, point sources of respiratory irritation may exist and cause symptoms in sensitive individuals. The following analysis examines and identifies components of the HVAC system and likely sources of respiratory irritant/allergen exposure due to water damage, aerosolized dust, and/or chemicals found in the indoor environment.

Fresh air is provided by air handling units (AHUs) located on the roof. Air from the AHUs is filtered, heated/cooled, and delivered to rooms via ducted supply vents. Air is returned/exhausted through vents in the ceiling. Direct exhaust ventilation was present in restrooms and some conference rooms. The waiting room bathroom was reported to have exhaust ventilation but was observed to be drawing weakly. Additional exhaust ventilation may be useful in the kitchen and copy areas where particulates and odors may be generated.

It is recommended that HVAC systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994). The HVAC system has reportedly just undergone balancing as part of the recent renovations.

Microbial/Moisture Concerns

Plants were observed in some areas (Table 1). Plants can be a source of pollen and mold, which can be respiratory irritants to some individuals. Plants should be properly maintained and equipped with drip pans to prevent water damage to porous materials. Plants should also be located away from air diffusers to prevent the aerosolization of dirt, pollen, and mold.

The backsplash/sink counter had a gap which did not appear to be sealed. Water may penetrate this gap and chronically moisten porous building materials.

Other IAQ Evaluations

Exposure to low levels of total volatile organic compounds (TVOCs) may produce eye, nose, throat, and/or respiratory irritation in some sensitive individuals. To determine if VOCs were present, BEH/IAQ staff examined rooms for products containing VOCs. BEH/IAQ staff noted air fresheners, hand sanitizers, cleaners, and dry erase materials in use within the building. All of these products have the potential to be irritants to the eyes, nose, throat, and respiratory system of sensitive individuals.

The offices were mostly carpeted. Carpets should be cleaned annually (or semi-annually in soiled/high traffic areas) in accordance with Institute of Inspection, Cleaning and Restoration Certification (IICRC) recommendations, (IICRC, 2012).

In some offices, items such as paper, boxes and decorative items make it harder for custodial staff to clean. Increasing storage and regular cleaning will help reduce particulate matter build-up that can become aerosolized.

Some areas within the space are subject to solar heating. Occupants reported that the dark, metal blinds were not effective to relieve the solar gain and at times temperatures reach over 80 F despite thermostat settings in these areas.

The toaster oven in the kitchen area was noted to have a heavy layer of bread crumbs settled on the bottom. Toaster ovens and microwaves should be kept clean to avoid the burning of food residue which will create odors and particulate matter within the office space. The lack of a local exhaust vent in the kitchen area will increase this effect.

Conclusions/Recommendations

Based on observations at the time of assessment, the following is recommended:

1. Operate supply and exhaust ventilation in all areas during occupied periods.
2. Have the HVAC system balanced every 5 years in accordance with SMACNA recommendations (SMACNA, 1994).
3. Monitor waiting area bathroom exhaust and increase exhaust ventilation if needed.
4. Seal gap between kitchen counter/backsplash to avoid chronic moisture exposure.
5. Consider having direct exhaust installed in the kitchen and copy areas to remove odors and particulates.
6. Regularly clean toaster oven and microwave to avoid burning food residue and resulting odors and particulate matter.
7. Consider installing window tinting in offices affected by solar gain to increase the comfort of occupants (#2067, etc.).
8. Keep plants in good condition, avoid overwatering, and avoid placing them on porous items such as carpets or paper. Also, keep plants out of the air stream of supply vents.
9. Reduce the use of cleaning products, sanitizers, and scented products.
10. Clean carpeting in accordance with IICRC recommendations (IICRC, 2012).
11. Reduce accumulated materials on flat surfaces and store in an organized manner to allow for thorough cleaning.
12. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

References

IICRC. 2012. Institute of Inspection, Cleaning and Restoration Certification. Carpet Cleaning: FAQ. Retrieved from http://www.iicrc.org/consumers/care/carpet-cleaning.

MDPH. 2015. Massachusetts Department of Public Health. Indoor Air Quality Manual: Chapters I-III. Available at: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-manual/.

SMACNA. 1994. HVAC Systems Commissioning Manual. 1st ed. Sheet Metal and Air Conditioning Contractors' National Association, Inc., Chantilly, VA.

Location: EOHHS center (DDS & DMH)

Address: 35 Nagog Park, Acton

Indoor Air Results

Date: 8/01/2016

Table 1

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Background	409	ND	70	21	21					Overcast, landscaping activity
Waiting area	520	ND	75	52	8	1	N	Y	Y	NC
2004	571	ND	75	53	7	3	N	Y	Y	NC
2003	549	ND	74	53	8	0	N	Y	Y	NC
2002	560	ND	74	52	7	0	N	Y	N	NC
Reception side	588	ND	75	53	11	5	N	Y	Y	carpet
2011 Conference	583	ND	75	52	7	4	N	Y	Y	Carpet, PC
2010 Files	584	ND	75	52	7	0	N	Y	N	AI on file cabinets
2009	577	ND	75	52	8	1	N	Y	N	Carpet
2012	592	ND	75	52	10	1	N	Y	N	Carpet

ppm = parts per million

$\mu g/m^3$ = micrograms per cubic meter

AI = accumulated items

DEM = dry erase materials

CP = cleaning products

HS = hand sanitizer

PC = photocopier

NC = not carpeted

ND = non detect

Comfort Guidelines

Carbon Dioxide: < 800 ppm = preferred

> 800 ppm = indicative of ventilation problems

Temperature: 70 - 78 °F

Relative Humidity: 40 - 60%

Location: EOHHS center (DDS & DMH)

Address: 35 Nagog Park, Acton

Indoor Air Results

Date: 8/01/2016

Table 1 (continued)

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 ($\mu g/m^3$)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
2008	606	ND	75	51	9	1	N	Y	N	Carpet
2014	607	ND	75	52	10	0	N	Y	N	Plants
2013	714	ND	75	52	9	2	N	Y	N	Plants ,carpet
Cubicles 2019-2024	602	ND	76	51	9	0	N	Y	Y	Carpet, CPs
2015	564	ND	76	51	9	0	N	Y	N	
2016	572	ND	76	51	8	0	N	Y	N	Plants
Cubicles 2026-2029	568	ND	76	51	9	0	N	Y	Y	
2017	564	ND	76	51	9	1	N	Y	N	
2018	580	ND	76	51	8	0	N	Y	N	DEM
Cubicles 2033-2038	581	ND	76	50	12	2	N	Y	Y	PC, HS, plants

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Cubicles 2034-2036	577	ND	76	50	10	2	N	Y	Y	
Cubicles 2039-2040	580	ND	76	50	10	2	N	Y	Y	AI
Cubicles 2041-2042	620	ND	77	49	8	1	N	Y	Y	Plants under air stream
Cubicles 2043-2047	588	ND	77	49	8	1	N	Y	Y	HS, microwave in hall
Cubicles 2049-2050	583	ND	77	48	10	2	N	Y	Y	Noisy supply vent over cube #2050, PC
Cubicles 2059-2054	568	ND	76	48	12	2	N	Y	Y	
Cubicles 2055-2062	577	ND	76	49	11	2	N	Y	Y	
Half wall offices 2072-2072	575	ND	76	49	11	2	N	Y	Y	Printer
Conference 2064	596	ND	75	50	10	0	N	Y	Y	

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Kitchen	647	ND	75	52	12	3	N	Y	Y	No local exhaust, sink backsplash/counter unsealed, toaster oven crumbs & residue
2067 office	622	ND	72	53	10	1	N	Y	Y	Solar gain, CP
2068	610	ND	74	53	10	0	N	Y	Y	

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